A WASTE MANAGEMENT PRIMER FOR ALBERTA

Alberta
ENVIRONMENT

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Contents

Garbage Is Many Things 3
Garbage Defined 3
Waste Storage 4
Waste Collection 6
Waste Disposal 9
Waste Treatment 14
Waste Recycling 17

Solid Waste Management In Alberta

Garbage is man's constant companion. It's hard to ignore but that's exactly what we've done for much of our past. By spending little time, money and effort on waste handling and disposal, we have allowed waste to pollute our environment.

A new awareness and concern about our living environment in the second half of this century has led to the development of improved techniques for waste storage, collection, disposal and treatment. Much of this technology is readily available and applicable to conditions found in Alberta. But it needs the support of every individual. As trash makers, we need a change in attitudes as well as new techniques.

The following chapters will help you, the reader, to understand **why** changes are necessary and **how** these can be accomplished.

Garbage Is Many Things

To some people, "garbage" is a term with bad associations. Not only does it refer to things we no longer want, but it also has come to mean things we do not like. "Garbage", therefore, is an emotional word. It conveys images of unpleasant smells, ugly appearances and things that are unappealing. Many people think garbage is a nuisance. They see it as a waste material that has no value and something we should not be spending money on. Their attitude is: ignore the problem and maybe it will go away.

This attitude is wrong for three reasons:

First, a quick review of history will reveal that many epidemics[1] were caused by poor sanitary conditions, usually because people were living with their own trash and streets were filled with garbage that attracted disease-spreading insects and animals. The ability of garbage to inflict misery remains as high as ever today and it is only through proper storage, collection and disposal procedures that sanitary conditions can be maintained.

1 Epidemic - rapid spreading of a disease so that many people have it at the same time.

Second, is the potential of garbage to supply reusable materials. Some estimates indicate that about 50 per cent of everything we throw away can be reused or recycled[2]. For example, objects made from paper, plastic, metal, wood and glass can be used again in their present form or may be converted into useful products by any of several recycling processes, which will be described later on.

2 Recycle - to allow used materials to become useful products by using them again for their original purpose or making them into new products.

Third, is our need to protect important resources, such as clean air and good drinking water, from contamination due to improper waste disposal.

Garbage Defined

Our vocabulary is rich with words that refer to discarded[3] materials. In technical terms, discards that are solid in nature are called **solid wastes.**

3 Discard - something thrown away as useless or not wanted.

As can be seen from the following diagram, mining activities produce a large amount of solid wastes in the form of tailings[4], slags[5] and other materials. Agricultural wastes from farming and ranching operations, as well as food processing, are also high.

4 Tailings - waste matter left over after the mining or milling of ore.

Mining and agricultural wastes, however, usually are generated in rural areas or remote locations where few people can see or come into contact with them.

5 Slag - rough, hard waste left over after metal is separated from ore by melting.

That's not true for wastes produced in our communities. This form of garbage, known as municipal solid wastes, is the main subject of this book.

Municipal solid waste (sometimes called refuse — pronounced **ref**use) contains all kinds of materials, as shown in the table below:

Components of Municipal Solid Waste

Garbage — wastes from the preparation and storage of food.

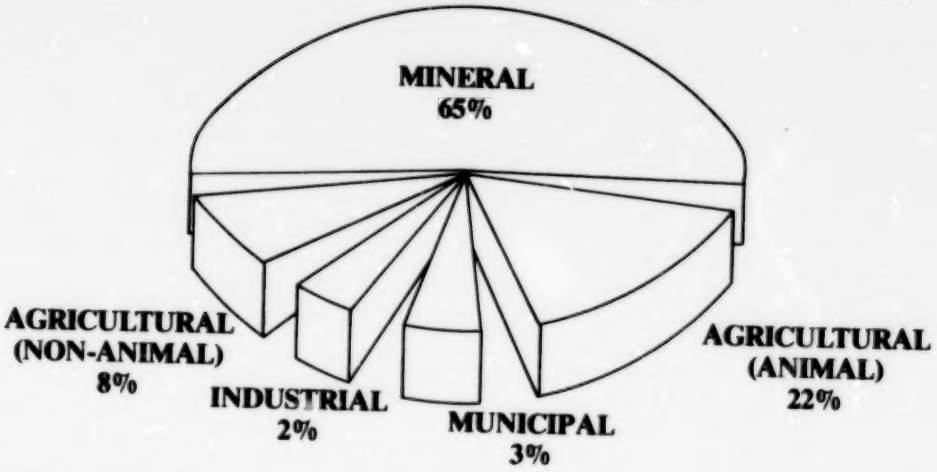
Rubbish — paper, wood, cardboard, cloth, plastics, yard trimmings, leaves, glass, metal, stones and dirt.

These wastes take the form of street sweepings; abandoned autos; household appliances and furniture; demolition[6] wastes such as concrete, asphalt and building materials; litter and wastes produced in homes and commercial establishments. This doesn't include industrial and agricultural wastes. If these wastes were regularly delivered to community disposal sites, an even greater variety of materials would be found in our dumps.

6 Demolition Wastes - produced when buildings or roads are torn up or destroyed.

The methods used to store waste materials at their places of generation (for example, homes and restaurants) also vary. Many of these storage methods are inadequate, resulting in unsanitary conditions and community litter. It is at these places of waste generation and storage where we will begin our discussion of waste handling practices in Alberta.

Sources of Solid Wastes in Canada



Waste Storage

In Alberta, wastes from homes and commercial establishments, such as restaurants and shopping malls, are stored in plastic bags, metal cans, drums and boxes made from cardboard or wood.

Although household garbage can be stored indoors for a day or so, it and other wastes are usually kept outdoors. Animals and birds can pick away at food scraps in uncovered waste containers scattering garbage on the ground. Larger animals can tip containers over, creating an even larger mess. Plastic bags can be ripped open and cardboard boxes sometimes disintegrate when they become wet. When decaying food is left around, it not only smells unpleasant, but attracts birds, insects and animals. If left exposed on the ground, bacteria found in rotting food can spread to humans by infected pets or insects. This can result in several types of human intestinal disorders.[7]

7 Disorders - sickness; disease.

Every type of waste storage container has its advantages and disadvantages. For example:

Container Type	Advantages	Disadvantages
Paper or Plastic Bags	— light weight; easy to lift — volume can be expanded by simply adding more bags — will keep insects out when tied	— costly — bags easily ripped — not suitable for heavy or sharp objects
Metal or Plastic Cans	— easily lifted — can be covered — inexpensive	— unattractive when damaged — lids won't fit when bent — must be cleaned to minimize smell
Drums	— suitable as burning barrels, but this is against the law in most communities	— heavy; difficult to lift — if used for burning, hot ashes could set fire to wastes in collection trucks or at disposal site — no lids; animals, birds and insects can enter.
Large containers raised mechanically by collection vehicles	— allow greater storage volume — have lids — no manual lifting	— more costly

No matter what kind of storage container is used, it will be useless if allowed to overflow. The solutions to overflowing are:

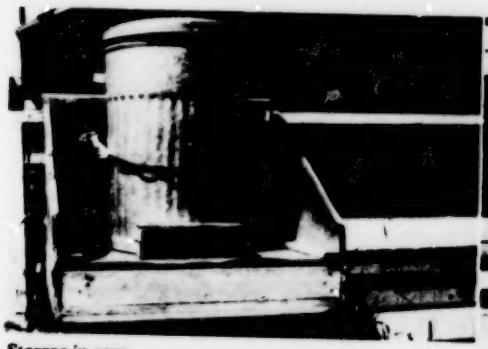
1. Use more containers.
2. Use larger containers.
3. Deliver wastes to disposal sites more often.
4. Use compactors to squeeze more wastes into a given volume using specially designed compaction containers.
5. Best of all, produce fewer wastes.

With the exception of suggestion number 5, higher initial costs are associated with the above solutions. But with time the use of these solutions can lead to lower costs, more efficient collection and elimination of litter and unsanitary conditions.

Burning barrel.

Bag storage.

Commercial establishments, particularly those preparing and serving food, must be especially careful to store their wastes properly. At busy restaurants, for example, it may be necessary to haul wastes to a disposal site every day to prevent unsanitary conditions. Unfortunately, many homeowners and business people allow wastes to be stored outside in improperly covered containers. Some still throw uncontained wastes on the ground. This is unacceptable, unhealthy and inconsiderate to others.



Storage in cans.

Four cubic yard container.

In residential areas where a garbage collection service is provided, homeowners must be careful not to put their garbage out for collection too soon. Containers or bags placed outside overnight can be tipped over or entered by animals. If containers are stored outside, near back lanes, they must be properly supported so animals can't tip them over. This leaves a mess for the garbage collector to clean up and adds to the cost of collection which taxpayers must pay. An extreme case of animals upsetting waste containers occurs in communities near forested areas that are inhabited by bears, wolves and other scavenging animals. Some of the most rigid control measures used in Alberta apply to residents and businesses in Banff and Jasper where special storage bunkers must be used by commercial establishments. Strict regulations prohibit overnight storage of residential waste at curbside and residents are being encouraged to use animal-proof storage bunkers in those parts of

town where back lane pickup occurs. These two towns may require somewhat drastic measures, but other communities have also passed bylaws to control waste storage and collection practices. These regulations are provided for the benefit of all residents and should be followed.

To avoid unnecessary spillage of wastes, some simple rules should be followed:

1. If wastes must be stored outside, use only closed containers that cannot be upset, ripped or entered by birds and animals. Containers can be clamped to posts, surrounded by fencing or fastened in various ways to solid supports. Containers may also be hung from overhead supports but must be high enough off the ground so that animals cannot overturn them.
2. If waste containers are moved from their normal storage location to a point for pickup by garbage collectors (such as back alleys or curbside), do not leave them at the pickup point for a long time. Avoid leaving containers at pickup points overnight.
3. Clean garbage containers periodically with a cleanser containing a disinfectant.
4. Clean up spilled wastes yourself and do it immediately. This should not be left to someone else.

When the amount of stored waste becomes too great or waste removal is somewhat infrequent, many people resort to burning their garbage in backyard barrels. Not only is this in violation of municipal bylaws in most communities, but it contributes to air pollution and has led to destruction of property, crops and forests. There is nothing that can be said in favour of burning barrels.

Air pollutants produced by this form of crude combustion are more than a nuisance. Burning barrels produce soot, smoke and a disagreeable smell. Worse still, air pollutants produced in this way are known to cause long-term disorders of the lungs and throat and can irritate eyes as well as aggravate allergies.

Whatever costs might be saved by burning can easily be erased if a flaming piece of wind-blown debris starts a fire. Every year, in Alberta, personal property valued at tens of thousands of dollars, as well as crops, fields and forests, are destroyed in this manner. Injuries and death have also resulted from this outdated practice.

To help lower costs, reduce storage space and improve efficiencies, a number of waste control devices are available for homeowners and business people. Small waste compactors can be used in homes. Larger ones are used in restaurants and other places where large quantities of wastes are generated. Compactors work on the principle of crushing and squeezing wastes into as small a volume as possible. This reduces the need for storage space and can mean fewer trips to the disposal site. Some apartment buildings use compactors located in the basement. Residents of condominium and town house complexes may be provided with large, centrally-located storage containers. Each person places his or her waste into the container rather than storing it inside or outside their individual units. This concept of communal storage containers is expected to become more widely used even for single family homes where door-to-door pickup may be replaced by one large container for every two or three homes.

Waste Collection

Normally, waste handling is subdivided into three activities: **storage, collection** and **disposal.** Of these, waste collection consumes 70-to-80 per cent of total costs. This is because collection involves many working hours. Nevertheless, a community-wide collection service is not as costly as having every family in a community haul its own wastes to a nearby disposal site.

Initially, collection services were provided only to urban residents, but now they are available to people living on acreages and other rural residents.

In communities where waste collection services are not provided, a number of problems develop. First, waste storage becomes more important because there is no set date or time when wastes are hauled to a disposal site. Secondly, many residents and business people decide to "save" money by burning their wastes in burning barrels. This results in a smoky, littered community. Worse still, when people haul their own wastes to a disposal site, improperly covered or contained wastes may be blown off their vehicles, creating a littered landscape.

Today, the province (under the Alberta Litter Act) and many municipalities require proper containment of wastes whenever they are being transported. Failure to do so can result in a fine. At the disposal site itself, people are asked to deposit their wastes in a trench. Because some people start discarding their wastes on the ground, those who follow try to dump theirs wherever there is little chance of driving over broken glass or having to walk through someone else's waste. The result: wastes are scattered widely over the site, often right out to the gate. This means expensive clean-up is required and, if not done right away, wind-blown litter can be carried from the dump to nearby properties. These annoyances can be minimized by using organized collection services.

Waste collection costs are usually paid by citizens through taxes, although sometimes payment arrangements can be made directly between the customer and the provider of the service. Collection is usually provided once a week; sometimes twice a week in summer. Special arrangements can be made to pick up bulky items once or twice a year. Some businesses require service every day. That, too, can be arranged.

Some communities purchase their own equipment and hire employees to operate collection vehicles. Other communities hire contractors to supply an equivalent service. In some major communities, residential collection may be handled by both contractors and municipal collectors. Contractors often collect wastes from commercial establishments and industries. In rural areas that are occupied by acreage developments or in circumstances where farms are located fairly close together, wastes can be collected from a point where the driveway or lane meets a road. Residents living in several rural municipalities near Alberta's major cities are served in this way.

Vehicles used for collection vary from pickup trucks or stake body dump trucks to more efficient trucks designed so that wastes can be compacted inside the truck body, thereby increasing the size of the load and reducing haulage costs. Most compactor trucks are designed to carry weights up to the maximum allowable by highway load limits.

Rear loader compaction truck.

Front-end loader

The number of employees assigned to a vehicle varies from one to three. Costs can be reduced by using only one person per vehicle. This is a major trend occurring throughout North America. Trucks can be loaded at the rear, from the front or at the side. Side loaders are popular because they are often operated by only one person who has to carry loads only a short distance before emptying them into an opening on the side of the vehicle. It is common for one collection vehicle to service 400 to 500 homes per day in urban areas. This means that 400 or 500 homeowners do not have to make the weekly trip and pose traffic problems at the disposal site.

Waste collection is an injury-prone occupation. Because waste collectors have to lift heavy objects, many of them suffer from back injuries, some of which are crippling. To solve this problem, the waste collection industry has introduced automated[8] lifting systems that grasp a waste container, lift it off the ground, empty it and lower it to the ground again.

8 Automated – refers to the use of machines in place of people.

At first, these systems were used for commercial and industrial wastes, but now more than 400 U.S. communities use automated or semi-automated systems throughout residential and commercial areas.

Automated systems are particularly well suited for back lane situations where one large plastic or rubber container per home is placed in a fixed location. Where curbside pickup is preferred, semi-automated systems are used, whereby each homeowner is given an upright container mounted on

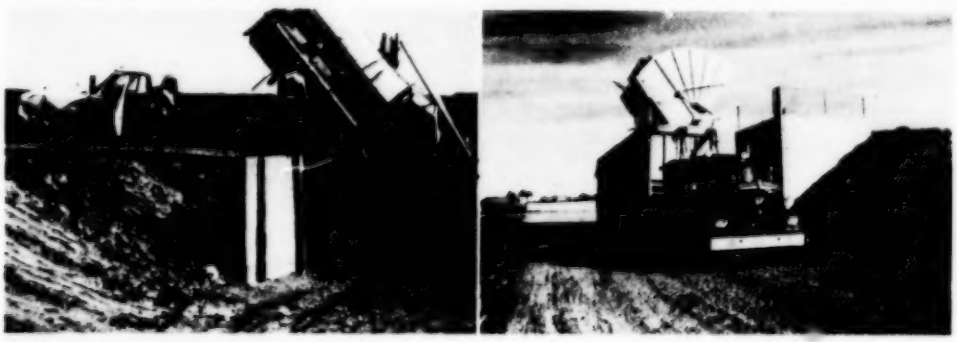
wheels. These carts are wheeled to curbside by the homeowner and are then lifted and emptied mechanically by the collection truck when it arrives. When a cart is empty, it can be wheeled back to its normal storage location.

Both automated and semi-automated systems have been used in Great Plains States that experience low winter temperatures similar to some parts of Alberta. They have also been used in other areas of the U.S. that receive more snow than Alberta. Because of their success in the U.S., automated systems are expected to become more common in Canada.

Transfer Stations

Many U.S. and Canadian cities are finding it costs too much money to drive every filled garbage truck many miles to a disposal site. When this happens — as it has in Halifax, Toronto and Edmonton — facilities known as transfer stations are built near residential collection routes. This allows filled trucks to drive only a short distance to a transfer station where wastes are transferred into large highway transports. Because each transport can hold loads from several garbage trucks, haulage costs can be lowered and garbage trucks are able to do what they do best — collect garbage.

The transfer station concept is also widely used in rural areas, because it allows a number of communities to share the costs of a waste haulage service. In addition, poorly operated garbage dumps can be closed because they are no longer needed. Here's how it works. A large metal container is placed beside a ramp. People drive their vehicles up the ramp and unload their wastes by dropping them over the edge of the ramp into the container. When the container is full, it is hoisted onto a truck and hauled to a central disposal site. An empty container is left behind to receive other wastes. Systems of this kind are operating successfully in Prince Edward Island, New Brunswick, Ontario and some parts of Alberta. A variation of the concept is to use a container that can be inverted and emptied into a trailer.



Rural solid waste transfer stations.

Both types of containers can handle all kinds of municipal wastes except large quantities of heavy materials and hot ashes. Pieces from demolished buildings or broken pavement are sometimes too large to fit into containers.

In the case of inverting containers, a very heavy load cannot be lifted. Hot ashes dumped into a container may ignite combustible wastes already present, causing structural damage to the container. As a result, these two kinds of wastes are prohibited at rural and urban transfer stations. Large quantities of bulky wastes should be hauled directly to the disposal site. Hot ashes should be doused with water and cooled before being mixed with combustible wastes.

In some rural areas where the amount of waste is sufficient to justify the added expense, transfer stations can be of the push-pit type where wastes placed on a concrete pad are pushed by a dozer through an opening in a floor into a trailer waiting below. Alternatively, a crane[9] and grab-bucket can be used to transfer waste materials to a trailer.

9 Crane - a machine with a long, swinging arm, for lifting and moving heavy objects.

Most rural transfer stations are surrounded by a litter fence and are open during daylight hours only. This is to prevent any vandalism and unnecessary maintenance costs which could result if left open all the time. In Alberta and elsewhere, abuse is the exception rather than the rule. But when it occurs, it upsets and inconveniences other people.

When properly managed, a transfer station represents an inexpensive way to replace the unmanaged garbage dump — an eyesore and nuisance that has no place in a clean environment.

Waste Disposal

After wastes have been stored for a period of time, they are either collected or hauled by the waste producer to a disposal site. Here, they are deposited on top of the ground or placed in a trench[10] dug into the soil. This becomes the final resting place of our wastes. And what is done with these wastes after they reach a disposal site makes the difference between a well-managed,[11] sanitary operation and one that is an environmental health hazard.

Disposal should not be confused with waste treatment[12] processes such as incineration, recycling and composting. Even after wastes are processed, there is always something left over that requires disposal. Incineration[13] of wastes results in the production of an ash that must be disposed of. Wastes such as appliances, bricks and junk autos cannot be incinerated, but something must be done about their disposal, too.

It's the same thing for composting:[13] cans, bottles and plastics must go to a disposal site rather than into the compost pile. Recycling[14] does not provide methods for reusing everything either. So, no matter what we do with our wastes — squeeze, burn, compost or recycle them — there will always be a need for a disposal site. If more of our wastes were processed in some manner, the disposal sites we now have would last longer and our future needs could be considerably smaller.

Because disposal involves placing wastes on or in the ground, people often are not aware of the changes in disposal methods taking place. Over the past 20 years, methods of moving wastes and compacting them with specifically designed equipment, combined with various environmental protection procedures, have evolved into the waste disposal procedure called "sanitary landfilling." This is the safest method of waste disposal known to us.

In Alberta, two types of waste disposal methods are allowed by law. They are:

1. Modified Landfilling
2. Sanitary Landfilling

Modified Landfilling

Modified landfills are used by communities having fewer than 10,000 residents or rural areas with disposal sites serving less than 10,000 people.

When a disposal site handles wastes produced by 10,000 people or more, a sanitary landfill must be used.

A dry disposal site may be established to receive wastes such as demolition materials or ashes but cannot be used for normal household garbage or other offensive wastes.

Before any waste disposal site can be established, permission must be granted by the Board of Health.* The Board's main concerns are to ensure that wastes deposited at a particular location do not enter waters on the surface or under the ground (called groundwater), or become a health hazard in any way.

Unfortunately, many disposal sites in Alberta began operating quite a few years before regulations were created to control them. These dumps were often located in ravines, on river banks, in sloughs and other places of no value for other purposes such as crops or pasture. From these dumps, wastes entered streams, rivers and the groundwater system, causing needless contamination.[15] Some of these old dumps are still operating but most no longer contaminate water courses. Efforts by health inspectors have helped to correct most problems.

*See your local Board of Health for specific requirements and details about the permit system.

10 Trench - refers to a rectangular-shaped hole dug into the ground to accept waste materials. Dimensions are often 61 metres (200 feet) long, 9 metres (30 feet) wide and 6 metres (20 feet) deep.

11 Manage - skillful handling of people and details to get desired results.

12 Treatment - refers to some mechanical process that causes garbage to become changed in some way. Also "processed".

13 Incineration and Composting - see "Waste Treatment" section for explanation and examples.

14 Recycling - see "Waste Recycling" section for explanation and examples.

15 Contamination - addition of an impurity (usually undesirable) to some substance.

Dump located in slough area.

Nevertheless, older dumps and newer modified landfills still cause concern to many people, especially those living nearby. Modified landfills must have fencing around the site to prevent litter from blowing away and to keep livestock out. But fences can't keep paper and plastics from being blown away if no efforts are made to bury these materials. Wastes at modified landfills are supposed to be deposited in a trench to be compacted by a bulldozer or other heavy vehicle at least three times a year and then covered with soil. This is done in some communities, but in the majority of cases, wastes are covered only once a year or less often.

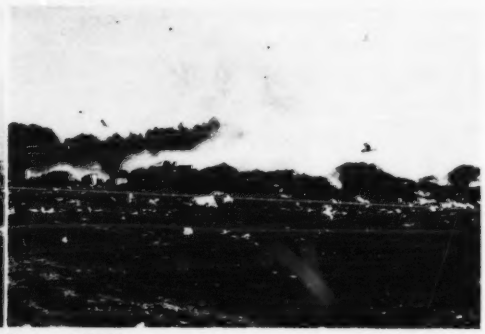
Most modified landfills are left open day and night as a convenience to users but this has resulted in wastes being dumped where they shouldn't be. Sometimes a messy disposal site results from an overfilled trench, but most often it's because some people will not place their wastes in the trench, leaving them scattered around the site.

16 Scavenger - a person who searches garbage dumps for junk that can be sold or used.

At an uncontrolled disposal site, scavengers[16] can pick through the discards of others and take various objects home for their own use. Scavenging is discouraged because contact with decomposing wastes can result in disease. Also, sharp and broken objects can cause injury. Some scavengers have been killed when run over by vehicles whose drivers didn't see them in or near a trench.

Some people like to burn their wastes at the disposal site. Wastes are also deliberately burned to reduce their volume and extend the life of the trench. Whatever the reason, burning of wastes is prohibited* in Alberta primarily because it is a health hazard and also because flaming debris can be blown onto nearby property causing destruction of forests, crops, homes and other buildings.

Scavenging.



Uncontrolled burning.

Also hazardous are discarded aerosol cans like those used for shaving cream and deodorants. When these containers are present in garbage that is being burned, they will explode and can fly through the air without warning, landing a good distance away from where they were launched.

Also, many people find the smell of burning garbage to be quite unpleasant. Often people living downwind[17] of a disposal site are unable to open windows or spend time outside without being repelled by the smell.

17 Downwind - refers to a location in the path of an oncoming wind.

Garbage left on the ground for any length of time attracts animals, some of which not only feed at the dump but live there as well. In Alberta rat infestations[18] near the Saskatchewan border have become a serious matter. Furthermore, rats are not the only disease-spreading animals that feed off garbage. Skunks, chipmunks, domestic cats and dogs, coyotes, bears, wolves and birds all find garbage an easy source of food. And because animals are in contact with decomposing[19] wastes, they are capable of spreading illnesses among other animals or to people.

18 Infestation - refers to large numbers.

19 Decomposing - decaying; rotting.

*In some circumstances, where none of the listed nuisances is likely to affect people in an adverse way, it may be possible to obtain a permit to burn wastes from the local health unit.

But all these management problems can be avoided or minimized if the following actions are taken:

1. Place all wastes in the trench, except for some bulky materials like junk cars, metal and demolition wastes that might be stored in separate areas of the landfill.
2. Do not burn wastes. This can only be done by a municipal agency in possession of a burning permit.
3. Avoid uncontrolled scavenging. This can be hazardous due to injuries. Under direction of a landfill supervisor, controlled salvaging of some materials could be allowed.
4. Maintain the landfill so that wastes do not accumulate on the ground or overflow from the trench.
5. Compact and cover wastes at least as often as required by regulations.

In some Alberta communities, people are realizing they are creating their own problems and accepting the need for improvements. They have minimized their concerns by burying wastes more frequently, prohibiting burning, using better litter fencing and restricting open hours at landfill sites. Some of these improvements cost money, but this is money well spent by taxpayers.

Sanitary Landfilling

At the opposite end of the scale from poorly operated modified landfills are the well-managed sanitary landfills. Some people are under the belief that "sanitary landfill" is just a fancy term for "garbage dump", when these two operations actually have very little in common. Communities which place signs beside their disposal sites calling them sanitary landfills, when in fact they are nothing else but unmanaged modified landfills, have helped to create this misunderstanding. It takes a lot more than a name change to qualify as a sanitary landfill.

Aerial view of a sanitary landfill.

For example, at sanitary landfills that serve 20,000 or more people, wastes must be compacted and covered every day. When the population being served is between 10,000 and 20,000, wastes must be covered three times a week. Anyone visiting a well-operated site after the last load of wastes has been covered, would be unable to tell what lies beneath the soil.

No one is allowed into a sanitary landfill unless there is an attendant on duty to supervise operations. High, sturdy fences and a gate are used to prohibit entry when the landfill is closed. In high-

wind areas, portable fencing is used around the spot where wastes are deposited to minimize littering. Open burning is prohibited and enforced by the on-site attendant. Separate areas are usually set aside for bulky wastes like concrete and wood, troublesome wastes such as animal carcasses and recyclable wastes such as appliances and car bodies. Where there is enough need, a special site can be established for materials such as wood, concrete and asphalt.

To minimize concerns over the possible contamination of drinking water and general nuisance to people, sanitary landfill sites are chosen only after detailed investigations are undertaken on soil type and depth, location of groundwater and proximity to residences.

Quite often people become alarmed and angry when they learn that a sanitary landfill is being proposed for some location near them. This reaction usually results from lack of information on how a sanitary landfill differs from the sort of garbage disposal sites used in the past. But once the landfill is built and it lives up to its sanitary expectations, there is seldom any opposition. In fact, some of those most opposed to it often become its biggest supporters. In most cases, what a person sees, hears or smells outside a sanitary landfill site provides few clues, if any, to what lies inside. You can't say that for a garbage dump.

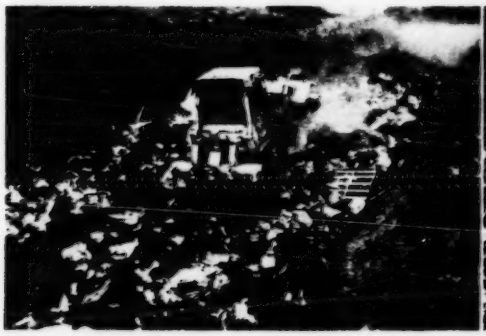
Regional Landfills

Albertans can be proud that some of Canada's best sanitary landfills have been built here during the past few years. Because of a program administered by Alberta Environment, a number of municipalities have now closed their old disposal sites and replaced them with large, centrally located sanitary landfills.

These regional landfills, serving a large geographic region, are used by residents of several towns, villages and hamlets, as well as people living in rural areas — all of whom contribute to operating costs through general taxation. The landfill is made possible by a provincial government grant[20] that pays for the purchase of land and a portion of the costs of building the landfill.

20 Grant - a sum of money transferred from one government agency to another.

All regional landfills are located on large enough parcels of land to allow operations to continue at that location for a minimum of 20 years. Because landfilling activities require about four hectares (10 acres) at any given time, the portion of land not used for waste burial can be farmed or used for pasture. When an area is full of wastes, it is covered with at least 0.6 metres (two feet) of topsoil and is seeded with grass. Eventually, the covered landfill can be restored to agricultural use or, if desired, it can be designed from the start to become a community park.



Compacting wastes.

Covering wastes.

Regional landfills are equipped with machines to excavate trenches and to compact and cover wastes. An on-site building is used to house that equipment and to serve as an office for the one or two employees who normally operate the landfill. Signs tell users where to deposit various kinds of materials and what hours the landfill is open to the public.

Ordinarily, a weigh scale[21] is used at each regional landfill over which all vehicles must drive. By recording the weight of waste originating in various communities and rural areas, operators can determine which portion of the total operating costs should be paid by the individual municipalities using the landfill. Management and operating decisions are made by a committee[22] of representatives from each of the participating municipalities.

21 Weigh Scale - a long platform scale used to weigh vehicles as they enter and leave a landfill to determine the weight of refuse dumped at the landfill.

22 Committee - refers to a group of people who work together to achieve a common goal.

Gate, fence, posted hours.

Weigh scale and attendant.

Sometimes, the closure of old disposal sites and the opening of a regional landfill requires people to drive much longer distances to the new site. Whenever this situation arises, transfer stations are built near individual communities for use by residents and the surrounding rural population. These transfer stations reduce the distance people must haul their wastes. Most people drive about the same distance they did in the past when a community disposal site was used. Ordinarily, transfer stations and the trucks that haul wastes from them to the regional landfill are managed by the same committee that operates the landfill. The operating costs of the entire system — transfer stations, vehicles and landfill — are paid through general taxes.

Sometimes people resist the concept of a regional landfill because they think it will cost more money than their old disposal site did. While a regional landfill costs more to operate than one individual modified landfill, it can replace up to a dozen modified landfills. The combined costs of operating all of these sites according to provincial standards almost always exceeds the costs of operating one regional sanitary landfill.

Now, that may not seem self-evident because some people think their local disposal sites cost nothing to operate. But when you consider the cost of digging a new trench every year and the time spent cleaning up sites and pushing wastes into the trench, you may find that taxpayers are already paying at least half the cost of a regional landfill and yet getting disposal sites that are often well below provincial standards[23]. And that doesn't include the personal cost of injuries, punctured tires and unpleasant sights and smells that accompany almost all modified landfills as well as the suspected long-term environmental damage that may be occurring at some.

The only problem with the sanitary landfill is that if the site is neglected equipment is not repaired when it should be, the gate is left open at night, and people stop caring about environmental protection, it will soon become nothing more than the garbage dump it was meant to replace. Management and perseverance are the keys to success. That's why Albertans must insist that operating standards be maintained.

The advent of large landfilling operations — particularly in climates that are warmer and more humid than Alberta's — has made it possible to recover the gases that are produced when wastes decompose underground. Until recently, these gases were regarded as a nuisance that had to be vented to the atmosphere, but in some U.S. communities, large scale systems are now operating to extract[24] landfill gas similar in composition to natural gas and use it as a fuel. At the same time that gases are produced, a liquid called leachate[25] is formed. This liquid is allowed to collect in the bottom of the landfill and kept from leaving the site by use of soils such as clay to prohibit the flow.

So, in a way, sanitary landfills not only solve many of the environmental problems associated with unmanaged garbage dumps, but may also allow the eventual recovery of a useful energy by-product of the process.

23 Standards - refers to Board of Health requirements for operating waste disposal sites.

24 Extract - to remove by application of some type of force. In this case, gas pressure or the use of suction causes gas to be drawn away from the landfill.

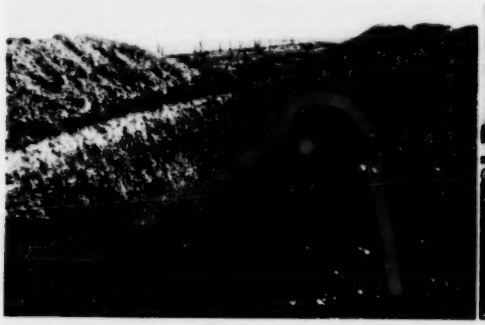
25 Leachate - a dark-colored liquid highly contaminated with chemicals that have been dissolved by water (usually in the form of rain or melted snow) passing downward through landfilled wastes.

Waste Treatment

As communities grow in size and complexity, their economies become more diverse through various mixtures of agricultural and industrial activities. This leads to the disappearance of good agricultural land beneath shopping centres, industrial parks and airports.

Competition for land is making it more and more difficult to obtain property that is both large enough and of the right soil type for landfills. In some parts of Canada, such as Newfoundland and much of the Northwest Territories, the prevalence of rock or permafrost[26] makes it almost impossible to find places where landfilling can be carried out. When these conditions arise, municipal politicians start investigating alternatives to simple landfilling.

26 Permafrost - soil that is frozen year round.



Gravel formations.

Rock formations.

Over the years, a number of waste treatment processes have been suggested, but many have been found unworkable because of cost or limited in their applications. But a small group of treatment systems still offers advantages to communities, from small villages to large metropolitan centres.

Incineration

The most common of these waste treatment methods is known as "incineration." Incineration refers to high temperature burning of combustible[27] materials under conditions where the methods of adding air and mixing it with wastes are strictly controlled. In this way, wastes are converted into ash and gases that are relatively harmless in nature. Incineration should not be confused with open burning, which occurs at low temperatures without any provision for mixing or controlled introduction of air. The resulting smoke contains many complex chemical substances and considerable volumes of soot.

27 Combustible - capable of being burned.

In the past, some incineration methods offered little improvement over open burning, but with the advent of air pollution controls in the 1970's, two notable methods of waste combustion developed.

The first type is used by three major cities in Canada, as well as others in the U.S. and other countries. Known as water wall incineration the method gets its name from the fact that wastes are burned inside huge furnaces, the upper walls of which are lined with water-filled tubes. As the temperature rises inside the furnace, heated water is converted into steam which can be used directly in heating systems or to generate electricity.

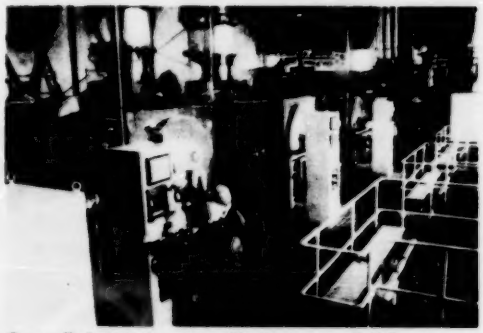
In one Canadian plant in Hamilton, Ont., electricity that is being generated enters the power grid and is distributed throughout the province. Two other plants, one in Montreal and another in Quebec City, produce steam to heat nearby buildings, run certain types of machinery and evaporate water from wood pulp in a paper mill.

In some European countries, heat recovery incinerators (as these are often called) are components used in the overall electrical generation and distribution systems.

Because of their large size, the furnaces employed in water wall incinerators can be fitted with various devices that make them very efficient. This means that the gases they generate are relatively free of objectionable chemicals and soot and do not smell of burned garbage. Filters can be used to

capture any solid particles that are emitted[28] with the gas. Experience in Canada and elsewhere has shown these incinerators are capable of satisfying the strict air pollution control requirements now in force.

The greatest drawback to water wall incinerators is their high cost. They cost tens of millions of dollars to build and are fairly expensive to operate. However, for cities the size of Hamilton, Quebec City and Montreal, incineration offers long-term advantages to the alternative of hauling wastes to landfills that keep moving further away from the city as available land is consumed by residential and industrial developments.



Controlled air incinerator, Charlottetown, P.E.I.

The second type of waste combustion system is called controlled air incineration. This method is more flexible than water wall incineration because units can be built for small quantities of waste such as produced by schools, hospitals and shopping malls. Even some resource exploration companies are using portable systems of this kind at work camps in Alberta, British Columbia and the Yukon Territory. By building larger units or placing several of them beside each other at a specific location, it is possible to offer an incineration option to communities with populations varying from a few hundred to several thousand people.

The greatest concentration of controlled air incinerators in Canada is found in the Duncan area of Vancouver Island, but others are operating in Ontario, Prince Edward Island and the Northwest Territories. Plans are underway for such an incinerator at Wainwright, Alberta.

Generally, operating costs of controlled air incinerators are higher than landfilling costs. But this cost comparison is of little value if landfilling is impossible because available land is either unsuitable or insufficient for landfilling of raw wastes. This is precisely the situation that prompted use of these incinerators on Vancouver Island. Wastes such as appliances and ashes that need to be landfilled are handled on small sites adjacent to the incinerators. And the gases emitted by these incinerators satisfy the air pollution control requirements[29] of the various provinces where they are located. In addition, heat recovery boilers can be added to controlled air incinerators to allow the heat produced to be used for various purposes such as hot water heating of nearby buildings.

Baling

The high wind conditions experienced in southern Alberta and some U.S. Plains States make it virtually impossible to operate a sanitary landfill on days that are especially windy without paper, plastic and cardboard materials being carried by the wind and dropped as litter on nearby fields and homes. Even careful placement of litter screens will not catch everything on days when winds gust from various directions.

This was the situation in a Nebraska town of 7,000 people before they began baling their wastes in large cubes held together with wire similar to hay bales. Today, at the baling plant, garbage trucks dump their loads inside a closed building protected from the wind. Wastes are moved by conveyor[30] into a large machine that compresses them into bales and then straps the bales with wire. The bales are then carried outside and stacked on the landfill, bringing an end to littering problems caused by gusting winds.

Baled waste, Nebraska.

Baling offers other benefits, too. The act of compressing all those wastes together changes odour so that bales no longer smell like garbage nor attract animals and birds. Operating costs are comparable with those at some of Alberta's

28 Emitted - discharged from a chimney or stack.

29 Air Pollution Control Requirements - refer to maximum amounts of substances that can be discharged into the atmosphere.

30 Conveyor - a wide, continuously-moving belt or platform used to carry materials from one point to another.

regional landfills. Also, when the baler is not being used to bale garbage, it can be used to bale scrap metal or cardboard. Although waste balers are not being used in Canada, there are several operating in the U.S., including one in Fairbanks, Alaska.

Shredding

Another method of waste treatment that produces change in odour is shredding. It evolved during the 1960's when there was considerable interest in attempts to recover reusable materials from mixed municipal wastes. The first step was to pass wastes through a shredder which chopped everything into small pieces making it easier to remove metals with magnets, while paper and plastics could be separated from heavier materials using a blast of compressed air. Somewhere along the way, it was discovered that shredded waste could be placed on a landfill without attracting animals or giving off a bad smell. Furthermore, these wastes didn't blow around, even on the windiest days. These advantages became important to communities that had limited amounts of soil available to cover their landfills or were operating disposal sites in close proximity to residential developments.

Most wastes produced in Edmonton are shredded at two of the city's transfer stations. Shredding is also used in Ontario and several U.S. cities.

Composting

One waste treatment process that can be undertaken at home or on a much larger scale is called composting. Basically, it involves mixing certain types of wastes together with some air and tiny, naturally occurring micro-organisms[31]. This leads to conversion of garbage and other materials into a soil-like material that can be used as a mulch[32] by home gardeners or to upgrade large areas of poor quality soil.

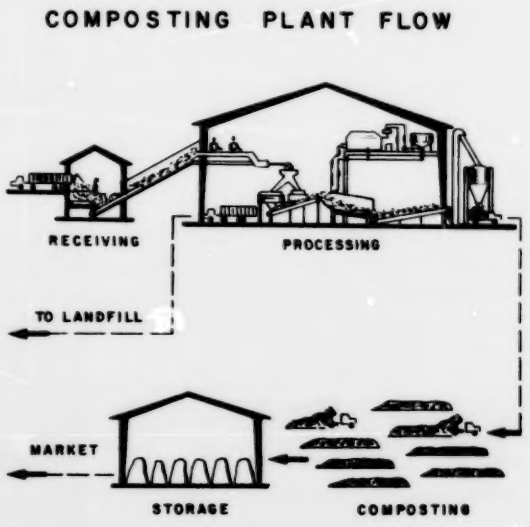
The City of Windsor in Ontario is operating the only large-scale composting facility in Canada, but the material being composted is sludge from sewage treatment plants rather than municipal refuse. Initially, its purpose was to produce a material to replace topsoil during the conversion of a former landfill site to a city park. But, the compost was found so beneficial that the city has made plans to use all the compost that can be produced for the next 10 years. Even though Windsor's compost is being made from sewage sludge[33] rather than garbage, other installations in the U.S. and Europe use normal municipal waste for composting after removal of non-biodegradable materials like glass, metal and plastic.

31 Micro-organism - a living thing too small to be seen except with a microscope.

32 Mulch - mixtures of materials often used to prevent evaporation of moisture from soil.

33 Sewage Sludge - the semi-solid material that remains after liquid sewage undergoes treatment.

The waste treatment processes just described, as well as others that have been experimented with from time to time, have been popular in countries that are more densely populated than Canada because of limited opportunities for landfilling. But even here in Alberta, many people are becoming alarmed over the removal of good farmland from agricultural production. That's why it's important to remember that landfilling of untreated wastes is not the only option available to us in the future. But people must be prepared to pay the often higher cost of other processes.



Municipal composting plant.

Waste Recycling

The term "recycling" became widely used during the 1960's and '70's. It came to mean any process that allows materials to be reused instead of discarded as wastes. As a concept, recycling was originally promoted by environmental activists[34] who saw in this an opportunity to prevent us from becoming overwhelmed by our trash. But despite its many merits, recycling has yet to live up to its full potential. Understanding why this recycling option has sometimes failed can provide guidance for the future.

34 Environmental Activists - citizens' groups which urge governments and industry to take action against environmental pollution.

Back in the 1960's, citizens who were concerned about pollution formed environmental groups, many of which began operating recycling depots where people could drop off bundled newspapers, metal cans and glass bottles of all sorts and colours. In many communities, the initial support for voluntary recycling was high. But as time passed, a number of difficulties arose.

First of all, environmentalists tried to penetrate markets already being pursued by well-established companies such as scrap dealers. These companies are experienced in finding and developing new markets for a wide variety of materials. This made it difficult for the environmental groups to get a first crack at new markets for recycled goods.

Secondly, markets for secondary materials tend to fluctuate widely in demand and prices.

Thirdly, markets for recycled materials were often located long distances away from the suppliers with the result that transportation costs often exceeded the value of recycled goods as commodities.

Eventually, people became aware of these difficulties and began asking themselves why they should bother to support recycling depots if materials like glass and paper couldn't be sold.

The combination of low public participation, high transportation costs and fluctuating markets killed some recycling projects. Others survived only because they were subsidized[35] in some way by government grants, volunteer staff or donated facilities. But that was before the energy crisis of the early 1970's.

35 Subsidize - aid or assist with a grant of money or services.

In the meantime, the poor image acquired by voluntary recycling efforts led many people to believe the only answer was to build huge waste processing factories that would take garbage in one end and send various kinds of metal, glass, paper and plastics out the other.

By the mid-1970's, several expensive waste processing factories were built in the U.S. in addition to an experimental facility near Toronto. It soon became apparent these plants were too expensive to operate unless the same markets that had frustrated volunteer recyclers in the 1960's were developed.

At about the same time, energy prices rose sharply causing many large cities to look at municipal waste as a cheap fuel that could be used in heating systems or to generate electricity. This resulted in construction of heat recovery incinerators in several Canadian cities as well as many others in the U.S. and other countries.

Originally, waste processing facilities consisted of materials separation, but today they include heat recovery incineration. This provides an opportunity to obtain some benefit from combustible materials until such time as alternative markets evolve.

The energy crisis also caused a resurgence of voluntary recycling by certain industries which began finding the large quantities of energy required to process raw materials[36] too expensive. Already fabricated materials such as glass bottles and metal objects, for instance, could be reprocessed more cheaply. As a result, both forms of recycling — voluntary (sometimes called source separation) and large scale processing — are continuing to make inroads into markets traditionally supplied by raw materials from mines, forests or refineries.

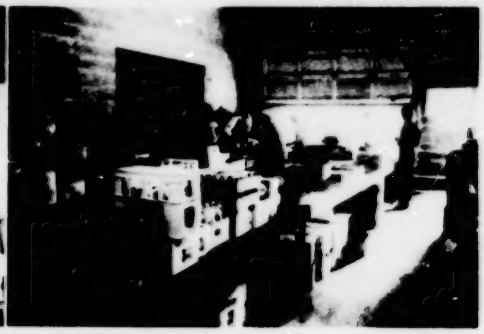
36 Raw Materials - refers to materials that have not been converted into products.

Beverage Containers

One of Canada's most successful recycling systems is the beverage container depot system operating in Alberta. Depots came into existence following the introduction in 1972 of the Beverage Container Act which requires that a deposit be placed on beverage containers such as soft drink bottles and cans, juice cans, some types of beer containers, as well as wine and liquor bottles. All of these containers can be returned to about 200 bottle depots across the province and exchanged for cash.

Bottles used for Canadian beer can be returned directly to Alberta brewers agents for their deposit return.

Inside a bottle depot.



Loading beverage containers.

37 Refillable - containers that can be filled and refilled several times with a product.

The depot system currently handles about 130 million containers a year, most of which are recyled. Refillable[37] soft drink bottles are reused by various soft drink manufacturers. Non-refillable glass bottles, metal cans and plastic bottles are recycled, too. Cans are shipped to steel mills; colored glass and some clear glass are used to make new bottles; other clear glass is converted into tiny beads used in light reflective paints that mark highway centre lines and shoulders; and plastic bottles are ground into foam for use in fiber fill pillows.

About 95 per cent of all refillable containers are being returned to depots. The return rate for wine and liquor bottles is about 85 per cent. There is still room for improvement in the metal can return rate. Only about 40 per cent of these are recycled, which means that most are still being discarded somewhere by people who could be returning them for cash.

Derelict Automobiles

Bottle depots are not the only successful recycling projects under way in Alberta. Most junk autos are now being processed by scrap dealers who find it worthwhile to do so. Initially, Alberta Environment subsidized the cost of collecting these vehicles, but a subsidy is no longer necessary.

Used Motor Oil

Used lubricating oil is another material that can be recycled. Already, two Alberta companies collect used oil from service stations and other suppliers. In a multi-stage treatment process, the used contaminated, dirty oil is transformed into a clear, honey-coloured oil. After certain additives are included, this re-refined oil can be used the same as new oil. With supplies of lubricating oil becoming more difficult to find, several major oil refiners have built used oil processing plants to take advantage of all the used motor oil that's available. Some 300 million gallons of used oil is generated each year.

Lubricating oil storage.

Used oil, left. Re-refined oil, right.

Albertans who change their own motor oil are being urged to return it to service stations equipped with waste oil storage tanks instead of dumping it on the ground or into a sewer. Alberta Environment is also helping some communities install storage tanks, particularly in rural areas where service stations may be several miles apart or have no used oil storage facilities of their own.

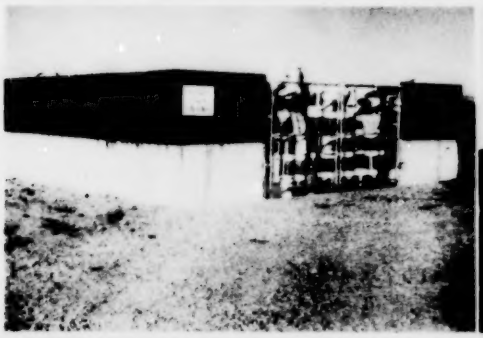
Rubber

Rubber tires can be recycled, too. They can be ground into small fragments, mixed with hot asphalt and sprayed onto roads as a paving material. Portions of several Alberta highways have been paved in this way to see if an asphalt-rubber mixture will reduce the cracking and crumbling that normally occurs when road surfaces contract and expand during seasonal temperature changes. In Saskatchewan, where the process has been used more extensively, results suggest that maintenance costs can be reduced although the cost of laying asphalt-rubber pavement is higher than for normal pavement. Most automobile tires currently being stockpiled at Alberta's regional landfills are for use in this, or some similar, application.

Stockpiled tires.

Road paving with asphalt-rubber.

Going hand in hand with these recycling programs are other projects meant to minimize the adverse effects our present waste disposal method have on the province's environment. For example, farmers are being encouraged to take their empty chemical containers to designated storage locations in rural areas. This keeps containers and their contents out of water bodies, ditches and dumps and allows the metal and plastics, from which the containers were made, to be reused. Metal can be processed by scrap dealers and sold to steel mills. Studies are under way to find methods of reusing various types of plastic containers.



Chemical container storage.

Steel mill.

As more Albertans become aware that opportunities exist to reuse our wastes — whether produced at home or the workplace — recycling will continue to work. About half of all materials we now discard are said to have some recycling potential. So the challenge to recycle more and waste less is there. All we need is the will and desire to pursue it.